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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/523,463	06/13/2005	Jurgen Pawlik	12834-00005-US	7585
23416 7590 03/30/2009 CONNOLLY BOVE LODGE & HUTZ, LLP P O BOX 2207 WILMINGTON, DE 19899				
EXAMINER				
HAN, KWANG S				
ART UNIT		PAPER NUMBER		
1795				
MAIL DATE		DELIVERY MODE		
03/30/2009		PAPER		

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

# Office Action Summary

**Application No.**

10/523,463

**Applicant(s)**

PAWLIK ET AL.

**Examiner**

Kwang Han

**Art Unit**

1795

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-25 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-25 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 02 February 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SE-08)
- Paper No(s)/Mail Date 2/2/05
- 4) ☐ Interview Summary (PTO-413)
- Paper No(s)/Mail Date \_\_\_\_
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_

**MEMBRANE ELECTRODE UNIT COMPRISING A POLYIMIDE LAYER**

Examiner: K. Han    SN: 10/523,463    Art Unit: 1795    March 30, 2009

***Priority***

1. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

***Claim Rejections - 35 USC § 112***

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 3 and 13 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Regarding claim 3, it is unclear as to the meaning of the term "frame" in reference to the polyimide layer. For the purposes of examination the term frame will be interpreted as a structure for admitting or enclosing something.

Regarding claim 13, the claim states "degree of doping is between 3 and 50". It is unclear as to what units the range of degree is referring to. For the purposes of examination it will be interpreted as a range of weight percent to be consistent with the limitations of claim 11.

***Claim Rejections - 35 USC § 102***

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5. Claims 1-3, 9, 10, 12, 14, 15, 24, and 25 are rejected under 35 U.S.C. 102(b) as being anticipated by Pineri (WO 2002/046278 using US 2004/0058216 for translation and citation).

Regarding claims 1, 15, and 24, Pineri discloses an ion conducting membrane for a fuel cell comprising a polyimide layer on the two surfaces (1, 3) of the membrane in contact with the electrode [Abstract, 0006, 0007]. It is inherent that an ion conducting membrane with electrodes used for a fuel cell, forms a membrane electrode assembly.

Regarding claim 2, Pineri discloses the thickness of the polyimide layer to be between 1 to 10 microns [0053].

Regarding claim 3, Pineri discloses the polyimide layer to be dense layers giving the character of impermeability to the gases, such as hydrogen and oxygen forming the frame around the inner portion of the membrane [0024].

Regarding claims 9 and 10, Pineri discloses the material of the proton conducting membrane to be doped with phosphoric acid [0050, 0052].

Regarding claims 12 and 25, the teachings of Pineri as discussed above are herein incorporated. It is noted that claims 12 and 25 are product-by-process claims. "Even though product-by-process are limited by and defined by the process,

determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process." In reThorpe, 777 F. 2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985). The membrane electrode assembly of Pineri is similar to that of the Applicant's, Applicant's method of forming a membrane is not given patentable weight in the claims.

Regarding claim 14, Materials used for electrodes inherently have some degree of compressibility.

### ***Claim Rejections - 35 USC § 103***

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

8. Claims 4, 5, 7, and 17-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pineri as applied to claims 1 and 15 above and further in view of Cavalca et al. (US 6300000).

Regarding claims 4, 17, and 18, the teachings of Pineri as discussed above are herein incorporated. Pineri is silent towards the electrode having an electrochemically active area whose size is at least  $2\text{ cm}^2$ .

Cavalca teaches a fuel cell electrode assembly with examples having a  $25\text{ cm}^2$  active areas with a performance output values showing milliamps per unit area (Column 22, Lines 30-63). It is well known and obvious to one of ordinary skill in the art to vary the size of the active area of the electrode for a fuel cell dependant on the power requirements for the system.

Regarding claims 5, 7, 19, Pineri is silent towards at least one of the polyimide layers being coated with fluoropolymers.

Cavalca teaches the use of a hydrophobic component such as a fluoropolymer including FEP (tetrafluoroethylene/hexafluoropropylene copolymer) concentrated at the electrode-membrane interface for the benefit of improving water repellency in the electrode structure (Column 13, Lines 18-26). It would have been obvious to one of ordinary skill in the art at the time of the invention to use a coating or layer of a fluoropolymer because Cavalca teaches it provides for improving water repellency in the electrode structure.

9. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Pineri in view of Cavalca et al. as applied to claim 5 above and further in view of D'Agostino et al. (US 4012303).

Regarding claim 6, the teachings of Pineri and Cavalca as discussed above are herein incorporated. Pineri and Cavalca are silent as to the thickness of the fluoropolymer layer.

D'Agostino teaches a fluoropolymer film layer (FEP) useful as a membrane for fuel cells [Abstract] having film thicknesses up to 10 mils (254 microns) to provide mechanical strength and resistance to back pressure (Column 3, Line 58-Column 4, Line 8). It would have been obvious to one of ordinary skill in the art at the time of the invention to have a fluoropolymer film layer to have a thickness up to 10 mils thick because D'Agostino teaches it provides mechanical strength and resistance to back pressure when used in a fuel cell assembly.

10. Claims 8, 11, 13 rejected under 35 U.S.C. 103(a) as being unpatentable over Pineri as applied to claims 1 and 10 above and further in view of Savinell et al. (US 5525436).

Regarding claim 8, the teachings of Pineri as discussed above are herein incorporated. Pineri teaches the electrolyte membrane to be comprised of sulphonated polyimides but is silent towards the membrane comprising polyazoles.

Savinell teaches solid polymer electrolytes to be comprised of various polymers containing basic groups that can form complexes with stable acids or polymers

containing acidic groups such as polyimidazoles, polybenzoxazoles, etc. to form solid polymer electrolytes which are stable and retain sufficient ionic conductivity at high temperatures (Column 2, Lines 51-67). It would have been obvious to one of ordinary skill in the art at the time of the invention to have the electrolyte membrane to include polyazoles because Savinell teaches these polymers can form complexes with stable acids or polymers containing acidic groups to form a membrane which are stable and retain sufficient ionic conductivity at high temperatures.

Regarding claims 11 and 13, Pineri discloses a membrane doped with phosphoric acid but is silent towards the concentration of the phosphoric acid.

Savinell teaches a proton conducting membrane for a fuel cell that is doped with phosphoric acid to about 50 wt% [Abstract] (Column 10, Lines 8-22) for forming a polymer electrolyte membrane capable of conducting protons in temperatures excess of 100°C. It would have been obvious to one of ordinary skill in the art at the time of the invention to use a membrane doped with phosphoric acid to 50 wt% because Savinell teaches this produces a polymer electrolyte membrane capable of conducting protons in temperatures excess of 100°C.

11. Claim 16-18, 20, 21, and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pineri as applied to claims 1 and 19 above and further in view of Bonk et al. (US 6399234).

Regarding claims 16-18 and 23, the teachings of Pineri as discussed above are herein incorporated.



Bonk teaches a typical fuel cell assembly where the electrodes (32, 34) and the thermoplastic material completely cover the membrane (48) (Figures 1, 2). It would have been obvious to one of ordinary skill in the art at the time of the invention to have the electrode completely cover the membrane because Bonk teaches this structure is typical for a fuel cell assembly.

Regarding claims 20 and 21, the teachings of Pineri as discussed above are herein incorporated. Pineri discloses the two polyimide layers but is silent towards the layers extending beyond the membrane.

Bonk teaches a PEM fuel cell which employs thermoplastic film layers which are extended to the edge of the fuel cell components such as the proton exchange membrane which is bonded and sealed to reduce the likelihood of introducing contaminants to the membrane (Column 8, Lines 47-57; Figure 2). It would have been obvious to one of ordinary skill in the art at the time of the invention to use a polyimide layer to be extended beyond the membrane and to be bonded because Bonk teaches this type of film layer structure for a fuel cell seals and reduces the likelihood of introducing contaminants to the membrane.

12. Claim 22 is rejected under 35 U.S.C. 103(a) as being unpatentable over Pineri as applied to claim 1 above, and further in view of Bonk et al. and Okamoto et al. (JP 2001-196082, machine translation).

Regarding claim 22, Pineri discloses the polyimide layer to be on the opposing sides of the membrane but is silent towards the polyimide layers to be in contact with the separator plates.

Bonk teaches a PEM fuel cell which employs thermoplastic film layers which are extended to the edge of the fuel cell components such as the proton exchange membrane which are bonded and sealed to reduce the likelihood of introducing contaminants to the membrane (Column 8, Lines 47-57; Figure 2). It would have been obvious to one of ordinary skill in the art at the time of the invention to use a polyimide layer to be extended beyond the membrane and to be bonded because Bonk teaches this type of film layer structure for a fuel cell seals and reduces the likelihood of introducing contaminants to the membrane.

Okamoto teaches an electrode unit structure for a fuel cell which provides a polyimide seal in contact with the electrode, membrane, and the separators at the peripheral regions to provide a seal to prevent the loss of moisture and acid [0012] (Drawing 1). It would have been obvious to one of ordinary skill in the art to combine the teachings of Bonk and Okamoto to form a polyimide layer further extended as a seal in Pineri's membrane structure because Okamoto teaches that a polyimide seal prevents the loss of moisture and acid within the fuel cell structure.

***Contact/Correspondence Information***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kwang Han whose telephone number is (571) 270-5264. The examiner can normally be reached on Monday through Friday 8:00am to 5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Dah-Wei Yuan can be reached on (571) 272-1295. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/K. H./  
Examiner, Art Unit 1795

/PATRICK RYAN/  
Supervisory Patent Examiner, Art Unit 1795